Patent Application of

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For

TITLE: SPRAY CADDY AND METHOD OF DISPENSING CHEMICALS

BACKGROUND--Field of Invention

This invention relates to spraying devices, and more particularly it relates to an improved multi-chemical dispensing device and method of cleaning useful to carpet cleaners.

BACKGROUND--DESCRIPTION OF PRIOR ART

Carpet mills have for years, recommended a method of cleaning carpet known as Hot Water Extraction ("HWE") whereby hot dilute detergent solution is topically applied to the carpet fibers then a powerful suction "extracts" the dirty water. HWE is best performed using a specialized van or trailer mounted cleaning machine or ("Machine") capable of delivering continuously hot (>180. degree. F.) and pressurized (40 to 100 pounds per square inch, psi) simultaneous with a powerful vacuum that "extracts" moisture from fibers. HWE is best described as a two step method (see prior art FIGS **1, 2,** and **3**) whereby:

The first or wash step, includes a spray application of a solution of surfactants, detergents and/or enzymes generally referred to as ("prespray"). A portable spraying device (prior art FIG **1**) known as a hand-held injection sprayer **112** is commonly used for dispensing the prepsray to the target surface **116** (prior art FIG **2**). Then, the carpet fibers are agitated (typically with a hand-held carpet rake or an electric rotary buffer) to help loosen and suspend soils, and a short dwell time of 5-15 minutes is allowed to maximize chemical action. This prespray, agitate, and wait step is similar to washing clothes whereby the washing machine fills with hot soapy water (detergent) then sloshes back-and-forth "agitating" the fibers.

The second or rinse step, requires use of a specialized tool of carpet cleaners called a ("wand"). Baig, in his U.S. Patent 6,263,539 (2001) refers to the wand **114** as having a tubular pipe with a vacuum head

having a vacuum channel and a spray head attachment. A solution supply hose **15** and a vacuum hose **17** extending from the work vehicle **13** to the cleaning site **14** (prior art FIG **3**) provide pressurized dilute cleaning solution and suction to the wand. A mist of hot water with a rinsing agent additive (chemical known to neutralize detergents) is topically applied through the spray head of the wand to the target surface **116** simultaneous with powerful vacuum or 'extraction' strokes of the wand. The rinsing agent chemically neutralizes the prespray and the extraction strokes remove (by suction) particulate and excess moisture to a waste tank at the work vehicle. Similarly, when washing clothes, spent wash water is replaced with fresh rinse water simultaneous with a spin cycle, which "extracts" (by centrifugal force) moisture from the fibers.

Carpet cleaners repeat this two-step method job after job, using their favorite group or ("suite") of chemicals in alternating fashion; wash then rinse and sometimes a fabric protectant. Cleaners carry ample quantities of their suite of chemicals in their work vehicle.

Some systems dispense all their chemicals directly from the Machine whereby, the Machine's integral water heater, water pump, and chemical metering pump, heat and dispense hot diluted ready-to-use ("RTU") solutions of metered chemicals from one of a plurality of 5 gallon chemical concentrate containers or "5 gallon jugs" (not shown) housed in at the Machine and delivers them through a length of solution supply hose **15** to the cleaning site **14** (prior art FIG **2** and **3**). Usually, two 5 gallon jugs are maintained; one of detergent and another of rinsing agent although, metering systems can be customized to dispense a suite of chemicals. Problems exist with systems that meter from the Machine.

Storing and transporting these 5 gallon jugs consumes the work vehicle's limited storage space and fuel; but the biggest problem with systems that meter from the Machine is the amount of time and energy expended by the operator or ("user") making repeated trips back and forth to the Machine as the job progresses switching or refilling the 5 gallon jugs, and/or to monitoring the metering pump flow rate settings as needed during the job. Further, it takes several minutes to flush the length of solution hose extending from the Machine to the cleaning site each time the switch is made (typically 100 feet or more). Attempting to save time and trips to the Machine, users adopt shortcuts like metering just one chemical (detergent) from the Machine throughout the job, skipping the rinse altogether. Detergent left in the carpet fibers leaves a sticky residue that dulls the carpet's appearance and acts like a magnet to new soil. It is like taking the clothes out of the washing machine after the wash cycle. And people who observe this method of carpet cleaning (especially women, whom know all about washing clothes), know intuitively that something is wrong with this method. It is no wonder people say "We don't want to get our carpets cleaned because it's never the same again."

To eliminate these repeated trips back to the Machine and still provide the necessary alternation of chemical, U.S. Patent 5,871,152 to Saney discloses a remote controlled carpet cleaner which "offers a

substantial increase in productivity by offering an operator the ability to remotely control and dispense required cleaning chemicals without making repeated trips between the cleaning site and a supply truck." These remote controlled transmitter/receiver systems have been proven successful, especially in operations like truck washes (Mechatronic Products Jackson, Tennessee) where water pressures of 3000psi and flow rates of 3-6 (gallon per minute, gpm) can flush the solution hose in seconds, but for lower pressure operations like carpet cleaning where pressures seldom exceed 500psi and 1gpm, remote switching does not solve the problem of flushing the length of solution hose. Trips to switch chemical are eliminated but other trips are still needed for refilling and monitoring flow rate settings during the job. The expense of such sophisticated electronics might also be prohibitive. Cleaners often revert to portable spraying devices to avoid this flushing problem; but available portable equipment introduces another set of problems.

Pump-up sprayers and electric sprayers are portable, reliable, and capable of dispensing a wide variety of chemicals hot, but both have disadvantages. Obviously, pump-up sprayers require endless manual pumping and electric sprayers require electricity and electrical cords or batteries. Refilling of these sprayers requires trips to the work vehicle for chemicals and manual mixing of RTU solutions thus there is potential for dilution error. Both types of sprayers require that RTU solution be carried throughout the cleaning site during application, which can cause fatigue.

A recent innovation in electric sprayers employs a delivery hose with memory (like a coiled telephone cord) enabling impressive aerial coverage (up to 40 feet) and reducing the fatigue associated with carrying RTU solution throughout the cleaning site. Yet, this tubing is not known to withstand the high temperatures (>180. degree. F.) required for HWE. Also, RTU solution in pump up and electric sprayers loses temperature as the job progresses. High temperature is so critical to effective cleaning that it would make sense to discard and replace lukewarm prespray mid-job if it were not so wasteful of chemical.

Various patents disclose other portable spraying devices capable of dispensing cleaning chemicals.
U.S. Pat. No. 5,020,917 to Homan et al. (1991) discloses a delivery system for mixing and metering cleaning solutions from liquid bulk concentrate storage containers into on-site individual usage dispensers. This system employs a sophisticated hydraulic and electronic design and a sturdy frame.
U.S. Patent No. 6,206,980 to Robinson (2001) discloses a multi-function cleaning machine suited for janitorial cleaning operations.
U.S. Pat. No. 5,095,579 to Becker (1992) discloses a multi-use cleaning center designed for carrying groups of objects within stackable and lockable compartments safely.
These inventions provide features advantageous to fields other than the present invention's field, that is, HWE cleaning. The complexity of design and lack of portability of U.S. Pat. No. 5,020,917 to Homan et al. (1991) prohibits its application in carpet cleaning. And none of these inventions provide a way of

communicating with the Machine for generating both the hot water and powerful suction necessary for achieving HWE.

Probably the most popular portable spraying device among professional carpet cleaners is the hand-held injection sprayer. It is a portable device like the pump up and electric sprayers yet it doesn't require manual pumping or use electric cords or batteries. And like the systems that meter from the Machine, the hand-held injection sprayer is capable of dispensing large volumes of continuously hot (>180. degree. F.) RTU solution without the need to carry containers of RTU solution.

The hand-held injection sprayer (prior art FIG **1** and **2**) receives heated and pressurized water through a length of solution supply hose **15** just like the systems that meter from the Machine but chemical doesn't enter the solution hose until its distal end, where the hand-held injection sprayer is attached. Chemical is siphoned or "drawn" from a 4 or 5 quart concentrate container or ("jug") **126** by a venturi injector **58** and then dispensed through a relatively short hose **122** connecting the hand-held injector assembly and spray gun **100** to the target surface **116**. Advantageously, this short hose **122** requires less time to flush relative to the time for the system that meters from the Machine. Unfortunately, the prior art hand-held injection sprayer introduces its own problems, including the fact that it is hard to use.

Carrying the hand-held injection sprayer can be tiring. Operation requires both hands; one hand to carry the rigid elongate member **124** (prior art FIG **2**) with tethered jug **126** and the other hand to control the spray gun **100**. Manipulating the length of solution supply hose **15** attached to injector assembly is difficult as any measure of hose movement is hindered by the weight and bulk of liquid-filled jug. Those skilled in the art, know of these and other problems with this spraying device.

The hand-held injection sprayer is designed to draw from only one jug at a time. Numerous jugs can be filled ahead of time, but since it is unsafe to leave a group of jugs strewn about the cleaning site **14**, the user must make repeated trips to the work vehicle to retrieve and switch among jugs. Having to stop and switch or refill jugs is tedious, time consuming, and ruins user concentration.

To switch jugs, a strap **128** (prior art FIG **1**) that tethers the rigid elongate member and jug must be removed before another jug may be secured. To refill jugs, the strap and jug cap **130** must be removed before more chemical concentrate can be added. Liquid concentrates are difficult to pour through the small cap opening of the jug (approximately 1 ½" diameter). Powdered concentrates are especially difficult to transfer into the jugs' small opening and even though powders are less bulky and more cost effective than their liquid equivalents, the difficulty in refilling the jug with powder actually discourages its use. The small cap also hinders dissolution of both powders and liquids.

Another problem with the hand-held injection sprayer has to do with changing the dilution setting. One must remove the strap (prior art FIG **1**), then unscrew the jug cap, then disassemble a tubing assembly **132**, and swap-out a metering tip **106**, then reassemble. Although this chore may seem to have been simplified with an improved version of the prior art hand-held injection sprayer (pat pending ? Hydro Force, 542 W. Confluence Ave. Salt Lake City, Utah, 84123) which allows the user to control the dilution ratio more directly by simply turning a handy knob protruding from the side of the venturi injector **58**, still, there is chance for error as the user must monitor and readjust this knob each time chemical is switched during the job and any mistake will adversely affect the cleaning result. For example, if the label directions of a particular chemical, says to use 4 ounces per gallon, it would be easy to mistakenly set the knob to 4:1 instead of the correct setting of 32:1.

Because it is hard to switch, refill, and adjust the dilution ratio of the prior art hand-held injection sprayer, the user may resist refilling it at the beginning of each job or may need more than one full jugs' worth of concentrate to finish a job; in either case, the user has to stop and refill during the job. In an attempt to eliminate these frustrating delays, some users purchase additional hand-held injection sprayers and dedicate each to a specific chemical.

Injectors dedicated to individual chemicals tend to clog and malfunction; especially when sticky chemicals like presprays, or fabric protectants are used. The same chemical meant for alternation with presprays during HWE, namely the rinsing agent, is also the perfect chemical for keeping the injector free flowing. Maintenance is required to prevent these dedicated injectors from clogging, otherwise breakdowns occur and repair costs are incurred. Dedicating injection sprayers also increases equipment costs and creates storage problems in the work vehicle.

All of the spraying devices known in the art suffer from a number of disadvantages:

(i) They all have problems managing, transporting and dispensing a suite of chemicals.
Metering from the Machine requires multiple 5 gallon jugs to be maintained at the Machine. Several 5 gal containers could be premixed to make up a days' worth of chemical (typically enough to clean 1,000sf), but this is impractical due to space consumed and the extra fuel needed to transport them from job to job. Flush times can be prohibitively long.
Pump up and electric sprayers can manage one or two chemicals in limited amounts (typically 1-4 gallons of RTU solution) but the chemical waste and labor associated with emptying and replacing chemicals mid-job prohibits the use of either of these devices as a multi-chemical dispensing device.
Hand-held injection sprayer can dispense large quantities of a single chemical but the tedium of managing and transporting multiple jugs renders this device impractical as a multi-chemical dispensing device.

(ii) They all present safety problems.

Chemicals metered from the Machine are often not identifiable as they enter the cleaning site. Multiple containers accumulate throughout cleaning site creating multiple potential safety hazards.

(iii) They all require trips back to work vehicle during the job.

Metering from the Machine requires trips throughout the cleaning process for switching, refilling, and monitoring chemicals. Pump up and electric sprayers require trips to retrieve and mix chemicals. Hand-held injection sprayers require trips for secondary sprayers or pre-filled jugs.

All known dispensing systems keep chemical supplies at the Machine. The user spends more and more time retrieving chemicals as the total distance from Machine to cleaning site increases.

(iv) They all have problems associated with the process of switching chemicals.

Switching among chemicals during the cleaning process is an important part of HWE. Repeated cycles of alternating prespray, rinsing agent, and protectant are necessarily applied as the job progresses from area to area throughout the cleaning site.

Chemicals and sprayers end up being strewn about the cleaning site or are kept at the work vehicle necessitating trips, which wastes time and energy. Switching chemicals during the job using known spraying devices is so time consuming, that it discourages users from doing so. Some cleaners abandon proper cleaning procedures altogether, skipping the trips and simply meter large amounts of detergent through the wand. There is little or no prespray applied, no agitation or dwell time; nor is there a rinse step. The cleaning result is visually less than desired. Customers are suspicious of the process; wondering how is it possible to do both a wash and a rinse in the same step. Their suspicions are confirmed when the carpet feels sticky once dried and when the spots reappear.

(v) They all require manual dilution adjustments during the job.

Metering from the Machine involves use of an imprecise non-calibrated knob for adjusting the amount of chemical dispensed.

Pump up and electric sprayers require manual measuring and mixing of chemicals with water thus there is potential for incorrect dilutions.

The prior art hand-held injector requires a dilution setting adjustment each time a different chemical is used. The old style requires changing of a small plastic metering tip, inside a tube, and further inside the jug. The new style has a handy adjusting knob built into the venturi injector itself; but if set incorrectly, over or under application will occur which may adversely effect cleaning results.

(vi) They all have problems associated with refilling their chemical supply containers, especially mid-job.

While metering from the Machine, 5 gallon jugs can empty or the metering pump can clog or malfunction with no indication to the user. Refilling these jugs and re-priming the metering pump requires a trip to the Machine.

Refilling pump up sprayers requires bleeding off of hard-earned pressure and electric sprayers often need re-priming after refilling.

Regarding prior art hand-held injection sprayers, many cleaners would rather purchase a second one and keep it ready at the work vehicle rather than go through the arduous task of refilling the jug mid-job.

(vii) They are all tiring.

The user quickly tires from the endless trips to the work vehicle when metering chemical from the Machine. On jobs with a lot of furniture to be moved, trip times and flush times could easily take longer than the actual time spent cleaning.

Pump up and electric sprayers wear the user down with endless manual pumping or electric cords. Having to carry volumes of RTU solution throughout the cleaning site is also exhausting.

The prior art hand-held injector jug can get heavy and hinder solution hose control. The device is especially awkward when trying to maneuver in tight places, behind doors, and under draperies.

(viii)They all have storage related problems.

All the spraying devices known in the art take up excessive amounts of space in the work vehicle or trailer. Special built-in holders are manufactured on some Machines to house the bulky 5 gallons jugs used to meter from the Machine. Special holders are also standard on some Machines for holding pump up sprayers, electric sprayers, and hand-held injection sprayers but none are known that hold more than one of each. Yet, many cleaners necessarily carry multiple pump up, electric, and/or hand-held injection sprayers. Storage space is used up quickly.

Objects And Advantages

This invention solves all of the above identified problems by providing a single multi-chemical dispensing device and still enables the user to perform HWE using a specialized van or trailer mounted cleaning Machine as defined by guidelines set by carpet mills, respected authorities and chemical manufacturers dedicated to the field.

Accordingly, several objects and advantages of the invention are:

(i) To provide a single spraying device, which can be used to manage, transport, and dispense an entire suite of chemicals.

(ii) to provide a spraying device which readily discloses written safety information regarding chemicals used and provides a safe place to store chemicals onsite.

(iii) to provide a single spraying device which dispenses all chemicals necessary for proper cleaning and requires no trips back to work vehicle once the spraying device is positioned onsite.

(iv) to provide a single spraying device which enables the user to easily switch among predetermined chemicals.

(v) to provide a spraying device which automatically adjusts the dilution ratio to the precise predetermined setting for the chemical selected.

(vi) to provide a spraying device which does not need refilling during a typical job (<1,000sf).

(vii) to provide a spraying device which frees the user from manual pumping, electric cords, and/or carrying of RTU solution thus preserving user's energy.

(viii) to provide a spraying device which stores easily on any relatively flat surface in the work vehicle and remains stable without the need of any special holding racks.

A still further object of this invention is to provide a spraying device which is inexpensive and easy to manufacture which can be provided as a kit and in a variety of shapes and sizes; customizable to a variety of chemical dispensing needs.

Further objects and advantages will become apparent from a consideration of the ensuing description of drawings.

SUMMARY

A new and novel spraying device and method is disclosed for storing, transporting and dispensing a plurality of chemicals with improved efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

The spraying device of the present invention may be more readily described by reference to the accompanying drawings, in which:

FIG **1** is a perspective view of prior art hand-held injection sprayer.

FIG **2** is a view of user at cleaning site applying chemical with spray gun to target surface, whereby chemical is dispensed using prior art hand-held injection sprayer.

FIG **3** is a view of user at cleaning site 'wanding,' whereby prior art system of metering chemical from the Machine is used for dispensing chemical to the target surface.

FIG **4** is a perspective view of the spray caddy of the present invention ready in its relative position to cleaning machine, solution supply hose, solution delivery hose, and vacuum hose.

FIG **5** is a partially exploded view of the handle assembly of the spray caddy.

FIG **6** is a perspective view of inner containers of the spray caddy

FIG **7** is a cross-sectional view of a metering tip assembly that fits on the base end of each supply tube

FIG **8** is a view of user at cleaning site applying chemical with spray gun to target surface, whereby chemical is dispensed using spraying device of the present invention.

FIG **9** is a view of user at cleaning site 'wanding,' whereby spraying device of the present invention is used for dispensing chemical to the target surface.

REFERENCE NUMERALS IN DRAWINGS

Spray caddy	10	Pinch clamp	66
Container	11	Draw tube MQD	68
Handle assembly	12	Second end	70
Machine	13	Second end MQD	72
Cleaning site	14	FQD	73
Supply hose	15	Storage containers	74a-c
Delivery hose	16	Drybag	74a
Vacuum hose	17	Spotter bottle	74c
Arrow-in	18	Holster	75
Arrow-out	20	Supply jars	76a-c
Base	22	Manufacturers' container	76c
Sidewall	24	Lid	82
Rim	26	Ladle	86
Trim	27	Supply tube assembly	88
Interior	28	Supply tube	90
Ribs	30	Supply tube FQD	92
First hole	32	Metering tip assembly	94
Second hole	34	Strainer	96
MSDS compartment	36	Base end	98
First end	38	Spray gun	100
First end nipple	39	Threaded insert	102
First end MQD	40	Tubing clamp	104
Coupler	42	Metering tip	106
Strainer assembly	44	Orifice	108
Adapter	46	Rubberized base	110
Screen	48	Hand-held injection sprayer	112
Body	50	Wand	114
Handlebar	52	Target surface	116
Handlegrip	54	Short hose	122
Injector assembly	56	Rigid elongate member	124
Venturi injector	58	Jug	126
Injector arrow	60	Strap	128
Check valve	62	Cap	130
Draw tube	64	Tubing assembly	132

DETAILED DESCRIPTION

Referring more particularly to the drawings by characters of reference, FIG **4** discloses a preferred embodiment of the spray caddy **10** used for storing, transporting and dispensing metered chemicals efficiently.

FIG **4** shows the spray caddy **10** of the present invention comprising a container **11**, handle assembly **12,** and inner containers. Spray caddy **10** is also shown in its relative position to cleaning Machine **13** and cleaning site **14,** supply hose **15,** delivery hose **16,** and vacuum hose **17**.

Container **11** of FIG **4** having the general form of a bucket comprises a base **22**, sidewall **24**, rim **26**, trim **27**, ribs **30**, interior **28**, first hole **32,** and second hole **34**.
Base **22** is a horizontal surface at one end of container **11** and integral to container **11**. Sidewall **24** extends from base **22** and terminates to form rim **26**. Container **11**, sidewall **24**, and base **22** house protect and support contents placed within interior **28**. Annular Rim **26** and ribs **30** bulge outward away from sidewall **24**. Trim **27** is made of a grippable material like thermalplastic, which improves handling of container **11** available from T&A Supply Kent, Washington. Interior **28** is defined by base **22**, sidewall **24**, and rim **26**. First hole **32** and second hole **34** through the sidewall **24** sight a line extending into the interior **28** that crosses the central vertical axis of the container **11**. Diameter of both holes is preferably of the same diameter as the broadest diameter of MQD **40**. Sidewall **24**, first hole **32**, and second hole **34** provide support and access for elongate rigid tubular handle assembly **12**. Rim **26** and ribs **30** provide structural reinforcement for sidewall **24**.

Spray caddy **10** of FIG **4** includes various safety features including MSDS compartment **36** and cover (not shown).

MSDS compartment **36** shown in FIG **4** is a sealable bag removably attached to sidewall **24** of container **11**. MSDS compartment **36** provides an accessible and visible place to store safety information regarding the chemicals used with spray caddy **10**.

Cover (not shown) is a lightweight poly shower-cap style enclosure with elastic band sewn circumference which removably fits over rim **26** of container **11** limiting access to interior **28** and inner containers. Cover may be stowed inside container **11** for ready access as needed. Suitable bucket cover is available from U.S. Plastics Lima, Ohio.

Handle assembly **12**, as shown in FIGS **4** and **5**, is in the form of an elongate rigid tubular body comprising a first end **38,** coupler **42**, strainer assembly **44**, handlebar **52** and handlegrip **54**, injector assembly **56**, and second end **70**.

First end **38** of handle assembly **12** or "upstream end" comprises a standard pipe nipple **39** of approximately 5 inches in length with threads at both ends. One end is threadably secured to first end *MQD **40**. When handle assembly **12** is in place, first end **38** typically extends beyond first hole **32** by about 2 inches and tubing portion extends through first hole **32** and into interior **28** of container **11** where it is threadably secured to coupler **42**.

*QD stands for 'quick-disconnect,' referred to herein to describe the two-part mating component commonly used for releasable fluid communication of tubing or hoses. The QD notation is prefixed with M for F to indicate Male or Female mating component although mating members could be reversed if desired.
A high pressure type QD is used with handle assembly **12** and with high pressure solution hoses. Suitable high pressure quick-disconnect fittings, BH2-60, BH2-61 are available from American Hose & Fittings, Kent, WA. Low pressure type QD is used with supply tubes **90a-c** and draw tube **64**. Suitable low pressure quick-connect fittings for tubing are available from Ryan Herco Products, Kent, WA.

Coupler **42** is threadably secured at one end to first end **38** and other end is threadably secured to adapter **46** of strainer assembly **44**. As with all the threadable connections of the handle assembly 12, standard pipe thread tape can be used during assembly to prevent leakage.

Strainer assembly **44** is a high pressure in-line particulate filter comprising an adapter **46**, screen **48**, and body **50** which serves to filter the water as it passes through the handle assembly **12**. The screen **48** nests inside body **50**. Body **50** is threadably secured to adapter **46**. A suitable strainer assembly **44** is available from Spraying Systems Company Wheaton, Illinois.

Handlebar **52** and handlegrip **54** form an elongate rigid tubular body with its midpoint centered over the central vertical axis of the container **11.** Handlebar **52** is a standard pipe nipple of approximately 5 inches in length with standard pipe threads at both ends. One end of handlebar **52** is threadably secured to body **50** of strainer assembly **44** and the other end is threadably secured to a venturi injector **58**. The handlebar **54** is encased in a similar length tubular cushioned handlegrip **56**. A suitable cushioned handlegrip **56** is available from Hunte-Wilde Corp. Tampa, FL

Injector assembly **56**, comprises a venturi injector **58** and check valve **62**, both components known in the art. As pressurized water flows through the venturi injector **58** in the direction shown by the injector arrow

60, a siphoning action or "draw" is created across an orifice (not shown) in the sidewall of the venturi injector **58.** Check valve **62** is fixedly secured over this orifice and extends about an inch perpendicularly away from venturi injector **58** encasing a ball bearing, ball seat, and spring (none shown) which act together to prevent pressurized fluid from escaping venturi injector **58**.

Draw tube **64** is fixedly clamped to the end of check valve **62** opposite the venturi injector **58** and is of sufficient length to reach medially from check valve **62** to any point along the rim **26** of the container **11**. Draw tube pinch clamp **66** slides onto draw tube **64** and can be used to stop draw through draw tube **64**. Draw tube MQD **68** is fixedly secured to the end of draw tube **64** opposite the check valve **62**. Suitable venturi injector **58** is model 797-3 available from DEMA Corporation, St. Louis Missouri. Suitable plastic tubing, and draw tube pinch clamp **66**, are available from US Plastics, Lima, Ohio.

Second end **70** of handle assembly **12** comprises a standard pipe nipple **71** of approximately 5 inches in length with a second end MQD **72** threadably secured to one end. The second end MQD **72** mates with FQD **73**. When handle assembly **12** is in place, second end **70** extends beyond second hole **34** by about 2 inches. Also shown in FIG **4**, is a holster **75** used for temporarily holding second end **70** when spray caddy **10** is in use. Holster **75** is a simple 2-hole electrical conduit bracket fixedly attached to inner wall of container **11** with screw and nut. The phantom of second end **70** can be seen resting in holster **75**.

The handle assembly **12** serves two useful purposes:
first, it serves to transfer pressurized fluid from the first end **38** and through the venturi injector **58** which draws chemical concentrate from one of a plurality of concentrate containers, mixing it with the water passing through handle assembly **12**, then dispenses dilute RTU solution to target surface of cleaning site **14**;
second, it serves as a handle for carrying the spray caddy **10** whereby handle assembly **12** itself is in the form of a horizontal elongate rigid tubular body with its cushioned handlebar **52** centered over the central vertical axis of the container **11** and with its ends protruding just beyond holes in container **11** such that an upward lifting force applied at the handlebar causes ends to contact sidewall and the spray caddy **10** is thus lifted with one hand and carried back and forth between cleaning site **14** and work vehicle.

FIG **4** and FIG **6** shows inner containers disposed within the interior **28** of the container **11** including storage containers **74a-c** and supply jars **76a-c**.

Storage containers shown in FIG **6** are in rigid form as storage jars **74b** and/or flexible-walled water-repellent fabric bags or drybags **74a**. Storage jars **74b** are preferably high density polyethylene, HDPE plastic wide-mouth jars (typical jar opening >2 inches) of variable sizes and with threadably sealable lids **82b**. Storage jar **74b** is used for storing liquids or powders and serves as backup to supply jars **76a-c**. A

drybag **74a** is a collapsible pouch-type container **11** made from water repellent cloth sewn or heat sealed along its top, sides, and/or bottom. A suitable material is 400 denier nylon packcloth from Seattle Fabrics, Seattle WA. The drybag **74a** keeps powdered concentrates reasonably dry within the container **11** and it conforms to available space within container **11** helping to stabilize other jars. Ladle **86** allows user to dig deep into the pouch for powder. Various other storage containers can be stowed in container **11** including a spotter bottle **74c** or spray bottle(not shown).

Supply jars shown in FIG **6** are in rigid form, preferably HDPE plastic jars and of variable sizes with threadably sealable lids **82a-c**. Supply jars **76a-c** can serve as storage containers but their main purpose is to supply liquid chemical concentrates to the venturi injector **58**. A one gallon jar **76a** is ideally sized for presprays; especially when powdered presprays are ladled from drybag and dissolved with the spray gun **100**. Manufacturers' chemical containers **76c** also work well as supply jars since there is no mixing. Quart sized jars **76b** are best for dilute chemicals like rinsing agents. Each chemical in a cleaners' suite is designated a specific supply jar and supply tube assembly **88**.

Supply tube assembly **88** as shown in FIG **6** comprises a supply tube **90a**, lid **82a**, supply tube FQD **92a**, and metering tip assembly **94a**. Each supply tube **90a-c** extends from the base of its designated supply jar **76a-c** and through a hole in its lid **82a-c** to the rim **26** of container **11**.
Supply tube FQD **92a-c** are fixedly secured to supply tube **90a-c** at the end nearest rim **26**. Supply tube FQD **92a-c** mates with the draw tube MQD **68**. FIG **4** shows supply tube **90c** of supply jar **76c** quick connected to draw tube **64**. Other supply tubes **90a** and **90b** are seen ready for connection to draw tube **64**.

Metering tip assembly **94** as shown in FIG **7** comprises a threaded insert **102**, a tubing clamp **104**, a metering tip **106**, and a strainer **96**. Rigid tubular threaded insert **102** with a smooth outer wall and a threaded inner wall and with an outer diameter ("OD") to match the inner diameter ("ID") of the supply tube **90** and length typically of about 1 inch is slid into the base end **98** of supply tube **90** so that the end of the threaded insert **102** protrudes just beyond the base end **98** of the supply tube **90** by about 1/16 inch. The threaded insert **102** is fixedly clamped inside the supply tube **90** with a tubing clamp **104**. The tubing clamp **104** is sized to that of the OD of the supply tube **90** and positioned over the supply tube **90** at a point where it squeezes down on the end of the threaded insert **102** furthest inside the supply tube **90** thus preventing leakage between the threaded insert **102** and supply tube **90**. Draw is thus restricted to the central bore of the threaded insert **102**. With the threaded insert **102** firmly in place, it is now possible to precisely set the dilution ratio using a component known in the art as a metering tip **106**.

DEMA Corporation, St. Louis Missouri manufactures a metering tip kit that complements their model 797-3 injector. The kit includes several individual color-coded metering tips covering a range of precisely calibrated orifice **108** sizes. Since the size of the orifice **108** of the metering tip **106** controls the amount of

chemical drawn and thus controls the dilution ratio, the user need only select the proper metering tip **106** to match the desired dilution ratio and thread it into the threaded insert **102**, see FIG **7**. A strainer **96** with a chemically-resistant rubberized base **110** (one suitable strainer **96** is the #10388 from RON VIK Corp. Minneapolis, MN) is removably slid onto the base end **98** of supply tube **90** thus preventing particulate from clogging the orifice **108**. The ID of the rubberized base **110** matches the OD of the supply tube **90**. With this metering tip assembly **94**, the user can precisely set the dilution ratio for the chemical designated to the supply jar **76a-c**. The metering tip **106** can be repeatedly changed as needed by simply sliding off the strainer **96** and threading in a different metering tip **106** then replacing the strainer **96**.

FIG **4** shows a spray gun **100**, one of several sprayer related accessories that can be stowed within container **11**. Spray gun **100** stows with its spray tip (not shown) resting upon base **22** of container **11**. A suitable spray gun **100** for carpet cleaning is model MV960 available from Ben's Cleaner Sales, Seattle, Washington. FIG **6** shows another accessory, a spotting bottle **74c**. Other accessories for a specific cleaning job might include spray bottles, upholstery tools, brushes, tape measure, and/or furniture tabs(none shown); all of which could be stowed in the spray caddy **10**.

From a review of FIGS. **4** through **7**, the assembly of spray caddy **10** from a kit will be apparent. The components that comprise each: the container **11** and its MSDS compartment, holster, trim, and cover, the handle assembly **12** and its first end **38**, coupler **42**, strainer assembly **44**, handlebar **52** & handlegrip **54**, injector assembly **56**, and second end **70**, and the inner containers and its plurality of storage containers **74a-c**, supply jars **76a-c**, supply tube assemblies **88a-c**, metering tip assemblies **94a-c** and various related accessories including the spray gun **100**, spotting bottle **74c**, and the means for which all these components are connected and associated can be pre-packaged together or separately into a kit. This kit includes any or all of the components necessary to assemble the spray caddy **10**. The kit is arranged and compartmented so that the container, handle assembly **12**, and inner containers and accessories and the components that comprise each, lay in the package ready for assembly.

Advantages

From the above description, a number of advantages of my spray caddy **10** become evident:

(i) Having a single spray caddy **10** to house all necessary chemicals and spray related accessories helps the user stay organized and conveys a sense of professionalism and organization to the customer.
(ii) User can have confidence in positioning the spray caddy **10** on cleaning site **14** because safety measures are in place. Customers appreciate knowing that all chemical safety information is in plain view within MSDS compartment along the sidewall **24** of container **11**.

(iii) Having all chemicals and spray related accessories close at hand at the cleaning site **14** saves user from making any subsequent trips back to work vehicle.
(iv) One-step quick connection between draw tube **64** and desired supply tube **90** simplifies the process of switching chemicals and encourages user to alternate among chemicals as the job progresses.
(v) One-time setup of supply tube assembly **88** for each chemical in user's suite obviates dilution adjustments during the job thus eliminating any chance of dilution error.
(vi) User stocks a days' worth* of chemicals ahead of schedule, loading manufacturers' containers **76c** or easy-fill wide-mouth supply jars **76a** or **76b.** Use of powdered chemicals is encouraged as drybag **74a** and ladle **86** permit easy transfer and stirring.
(vii) Time and energy is saved by not having to pump up sprayers, manipulate electric cords, or carry RTU solution.
(viii) Spray caddy **10** is single compact unit that stores easily and is easy to locate in the work vehicle.

* Note concerning days' worth of chemicals:
Container **11** of spray caddy **10** is sized to house the entire suite of chemicals needed for a specific application. In the case of carpet cleaning, three chemicals are used over and over: prespray, rinsing agent, and protectant. The container **11** must be large enough to house these chemicals s in sufficient quantities to complete an average days' worth of cleaning (assumed to be approximately 1,000sf).

Based on the typical recommended dilution ratios of each of the chemicals used, it can be seen that protectants are applied in a far more concentrated form than the other two chemicals:

Protectants	4:1 or more concentrated
Prespray	10:1 or less concentrated
Rinsing agents	320:1 or less concentrated

The best selling protectants are formulated to cover 1000sf per one gallon of concentrate. The spray caddy **10** thus makes room for a one gallon jug of protectant concentrate in its container **11.**
Presprays are more concentrated than protectants, such that one gallon of prespray concentrate will typically provide more than enough RTU solution to clean 1,000 sf of carpet (a drybag of powdered prespray will typically make several gallons of prespray concentrate).
Rinsing agents are extremely concentrated; such that smaller sized jars, say quart sized jars, hold ample concentrate to clean 1,000sf.
A standard 5 gallon bucket is of sufficient size to house the array of containers and chemicals necessary to accomplish a days' worth of carpet cleaning.

One-time setup of the spray caddy 10

The spray caddy **10** is designed to house a days' worth of chemicals. All chemicals used in routine cleaning can be categorized as user's predetermined suite of chemicals. Typical suite includes: prespray, rinsing agent, and protectant. Each chemical in suite is designated a supply jar **76a-c** and is fitted with a supply tube assembly **88** to match desired dilution ratio then stored within the interior **28** of the container **11**. Storage jars **74a-c** can also be stowed inside container **11** and used as backups. FIG **4** shows quart supply jars stacked one atop the other, **76b** atop **74b**.

Custom or combination chemicals and dilutions can be setup to suit user's preference limited only by the experience and knowledge of the compatibilities of such chemicals and combinations. Examples include: dyes of various colors and dilutions, prespray + detergent, powdered prespray + liquid solvent, rinsing agent + variably scented deodorizers, etc.

To setup user's predetermined suite of chemicals:

1. Select proper supply jar **76a-c** for each chemical based on manufacturer's recommended dilution ratio:
if label says **2**oz/gal or less, then use quart sized jar,
if label says **3**oz/ or more, then use gallon sized supply jar **76a** -or- manufacturers' container **76c**.
For purposes of measuring powders, treat 'powder ounces' as though they were 'liquid ounces.'

2. Select proper metering tip **106** from kit to match desired dilution ratio. Thread metering tip **106** into base end **98** of supply tube **90**, then install screen strainer **96**.

3. Select proper supply tube assembly **88** (supply tube **90**, lid **82**, FQD **92**, and strainer **96**) for each supply jar **76a-c**.

4. Fill supply jar **76a-c** with chemical (for tan metering tip **106**, add "oz chemical" then fill to top with water). Proper amount of powder is ladled from dry bag to supply jar **76a-c** for job, then hot water is added.

5. Insert supply tube assembly **88** into supply jar **76a-c**.

Spray Caddy Tip Selector
For DEMA 797-3 Injector

Dilution	If Label says:	Then Use:
4:1	**32** oz/gal	NO TIP
5:1	**25** oz/gal	Purple tip
6:1	**20** oz/gal	Black tip
7.1	**18** oz/gal	Yellow tip
9:1	**14** oz/gal	Blue tip
10.5:1	**12** oz/gal	Green tip
13:1	**10** oz/gal	White tip
16:1	**8** oz/gal	Red tip
21:1	**6** oz/gal	Clear tip
32:1	**4** oz/gal	Turquoise
50:1	**3** oz/gal	Orange Tip

For the dilutions below, use Tan tip.
Add chem to Quart Jar then fill to top.

Dilution	If Label says:	Oz. Chemical
66:1	**2** oz/gal	**32**
128:1	**1** oz/gal	**16**
320:1	**2** oz/ **5** gal	**6.4**
480:1	**1 1/2** oz/ **5** gal	**4.8**
640:1	**1** oz/ **5** gal	**3.2**
984:1	**2** oz/ **15** gal	**2.1**
1280:1	**1/2** oz/ **5** gal	**1.6**

Position supply jars **76a-c** and storage containers **74a-c** inside container **11**.

To better access interior **28**, remove handle assembly **12** by disengaging second end MQD **72,** put second end **70** in its holster **75** then simply lift handle assembly **12** up and out of container **11**. Position supply jars **76a-c** inside container **11** for ready connection between draw tube **64** and supply tubes **90a-c**. FIG **4** shows draw tube **64** still connected to supply tube **90c** of protectant supply jar **76c** from the previous job.

Operation

Stock Chemicals Daily

Supply jars **76a-c** and storage containers **74a-c** are replenished with days' worth of chemicals.

Inspect job

Upon arrival to each job, user inspects job and stows any additional accessories needed inside container **11** then carries spray caddy **10** to cleaning site**14**. Fully loaded, the spray caddy **10** weighs about **30** pounds. In just one trip, all chemicals and spray related accessories are onsite.

Setup hoses

Solution hose setup includes the user extending standard 50ft lengths of high-pressure solution hose the type used in carpet cleaning from its connection at the Machine **13** to the furthest point in the cleaning site **14**.

Lengths of solution hose are typically connected end-to-end with high pressure QDs equivalent to those described for use with the handle assembly **12**.

Vacuum hose **17** setup proceeds similarly: the user extends standard **50**ft lengths of vacuum hose **17** of the type used in carpet cleaning connected end-to-end with vacuum hose couplers from its connection at the Machine **13** to the furthest point in the cleaning site **14**. Vacuum hose **17** is laid parallel to the length of solution hose.

Connect spray caddy **10**

FIG **4, 8,** and **9** show spray caddy **10** in its relative position to Machine **13** and cleaning site **14**, supply hose **15**, delivery hose **16**, and vacuum hose **17**.

The spray caddy **10** is preferably positioned adjacent to the solution hose QD connection furthest into the cleaning site **14** and connected there inline as follows: first, the furthest-in solution hose QD is disengaged, next, the loose end of the solution hose extending from the Machine **13** or supply hose **15** as it 'supplies' hot pressurized water from the Machine **13** is connected to spray caddy **10** at first end MQD **40**, then, second end MQD **72** is disengaged from FQD **73** and second end **70** is stored in its holster **75**, and the other loose end of the solution hose just disengaged becomes the delivery hose **16** as it 'delivers' hot pressurized RTU solution to the cleaning site **14**, is passed through second hole **34** of container **11** and connected to FQD **73** downstream of venturi injector **58**.

Connected in this way, spray caddy **10** serves as a single source multi-chemical dispensing device. A broad area can be cleaned extending circumferentially (typically 50ft) from the stationary spray caddy **10**, whereby hot pressurized water passes through supply hose **15** in the direction of the arrow-in **18** and enters the spray caddy **10** through first end **38** of handle assembly **12**. Dilute chemical created at venturi injector **58**, exits through downstream end of handle assembly then passes through delivery hose **16** to target surface **116** of cleaning site **14** where it is dispensed through spray gun **100** or wand **114** to target surface **116**. Spent chemical, excess moisture, and particulate are extracted through the vacuum hose in the direction of the arrow-out **20** to a waste tank (not shown) housed in the work vehicle.

HWE is accomplished as follows:

Wash step: draw tube **64** is connected to supply tube **90a** of prespray supply jar **76a** and spray gun **100** is attached to distal end of delivery hose (see FIG **8**). Prespray is applied hot, then carpet is agitated, and a 5-15 minute chemical dwell-time is allowed. Spray caddy **10** is covered if left unattended.

Rinse step: draw tube **64** is switched to supply tube **90b** of rinsing agent supply jar **76b** and spray gun **100** is replaced by wand **114**. Rinsing agent is applied hot and then extracted with wand **114** (see FIG **9**).

Protectant step: draw tube **64** is switched to supply tube **90c** of protectant supply jar **76c** and wand **114** is replaced by spray gun **100**. Protectant is applied, then carpet is agitated (see FIG **8**).

The cycle is repeated, area by area throughout cleaning site **14** until job is done.

Return equipment to work vehicle

Upon completion of job, supply hose **15** and delivery hose **16** are reconnected as one unit and returned to work vehicle along with vacuum hose **17**. Spray gun **100**, cover, and any accessories are stowed inside container **11** of spray caddy **10**. Second end **70** is removed from holster **75** and reconnected to FQD **73**, and the spray caddy **10** is carried back to work vehicle. Spray caddy **10** is stored as one compact unit ready for the next job where it will serve as manager, transporter, and dispenser of all chemicals needed for that job and every other job to be done that day.

CONCLUSION, RAMIFICATION, SCOPE

The spray caddy **10** has additional advantages in that:

- User can take a minute to explain how the spray caddy **10** is used in the cleaning process and customer immediately understands how it helps the user work efficiently.
- The chemical being dispensed is readily discernable by its supply tube **90a-c** connection. All accessories are stored in one place – inside container **11**, and covered when not attended.
- However far the total distance from the work vehicle to the cleaning site **14**, chemicals and spray related accessories are always close at hand (typically within 50feet).
- Confidence and morale increases as the user becomes proficient at using the spray caddy **10**; realizing that switching among the necessary chemicals does help the user achieve HWE.
- Not having to worry about dilution settings, frees the user to stay focused on achieving the desired result, clean rinsed carpet.
- Time spent managing chemicals is reduced as compared to using other spraying devices. User realizes how 'powder friendly' the spray caddy **10** is and is encouraged to use powders thus saves money on chemicals.
- Using the spray caddy **10** wastes less energy in achieving the desired result thus provides a more efficient cleaning operation than if using other spraying devices.
- The spray caddy **10** is single reliable spraying device that takes up less space in the work vehicle thus other sprayers can be removed from work vehicle.

Finally, spray caddy **10** is made from readily available components. No special injection molding or electrical circuitry is needed. Assembly is easy, requiring only commonly available tools: a drill, screwdrivers, sockets, pliers, rivet tool, and wrenches.

For proper carpet cleaning, a van or trailer mounted cleaning Machine **13** is recommended because it is especially suited to deliver the hot water and powerful vacuum necessary to efficiently clean carpeting

however, satisfactory cleaning results can be achieved by using spray caddy **10** in coordination with equipment other than the Machine **13**. For example, sufficient heated water could be obtained from a portable boiler or a residential water heater. Electrical heaters, portable cleaning machines, or even the kitchen stove could supply hot water. And any electrical pump of approximately 50psi or greater or even a normal garden hose pressure of 40-80psi could deliver pressure sufficient to create draw at the orifice **108** inside venturi injector **58** and thus enable creation of dilute solution for dispensing. Sufficiently powerful vacuum could be obtained from portable cleaning machines or even wet-dry type vacuums, albeit inefficiently. This invention works with these and other combinations of heated water and vacuum generating equipment.

Spray caddy **10** could be useful anywhere there is a need for dispensing one or more chemicals and a pressurized source of fluid is available. First end **38** and second end **70** fittings could be modified to accept various types of hose fittings. For example, garden hose connectors could be fitted to the spray caddy **10** for use around the home to dispense various chemicals like car wash detergents, insecticides, and lawn foods. Any of a suite of predetermined chemicals could be dispensed, all from the same coverable container **11**. Auto shops could use spray caddy **10** to dispense windshield washer detergent, antifreeze, hand cleaner and concrete garage floor cleaner. It is also conceivable that the spray caddy **10** of the present invention could be used to dispense liquids other than water-based liquids. For example, if a solvent-based rinsing agent were used, spray caddy **10** could be adapted to dispense paints, lacquers or most any other solvent-based chemical with viscosity near that of water.

Variable materials, dimensions, types, and capacities could be incorporated without affecting the spirit of the invention.

Spray caddy **10** is light enough to be carried with one hand by its handlegrip **56** although could be modified to accept wheels or could be transported by a wheeled dolly without affecting the spirit of the invention.
Cover could be made of variable material and secured fixedly to spray caddy **10**.
Container **11** can be of various sizes and shapes including oval, square, rectangular or oblong.
Container **11** is preferably made of rugged lightweight material like HDPE plastic although any thin-walled rust and chemically resistant material would suffice,

Injector itself can be other than Dema's 797-3. Dema's injector is accepted by carpet cleaners and it will be easier for carpet cleaners to transition to the spraying device of the present invention. An injector with a broader range of dilution ratios is available for spray caddy **10**.

This invention describes QDs as the preferred way to deliver liquid chemicals to the injector. Any of several types of tubing QDs could be used without effecting the spirit of the invention.

There are many other functional yet less advantageous ways of providing communication between chemical and injector; the simplest might be a direct tubing connection from chemical concentrate to injector. Dilution ratio adjustment could be accomplished by varying the orifice **108** size by using metering tips **106** or the orifice **108** could be situated at the injector although the preferred embodiment of the present invention anticipates this design. The present invention obviates any dilution setting adjustment for a predetermined suite of chemicals.

Multiple chemical concentrate supply tubes **90a-c** could be brought to a junction using 2-way or multiple-way connectors that then connect to draw tube **64** which then feeds into injector; each supply tube **90** having its own pinch clamp **66** or on-off toggle. These and other systems of switching chemical, including push-button switching mechanisms could be employed that would no doubt be user friendly but would also be more expensive to implement and more likely to malfunction than the simple QD design of the present invention.

Plastic tubing can be of variable materials.

High pressure and chemically resistant tubing members of various types could be substituted for the nipples **39**, **52**, and **71** used in the present invention.

High pressure supply hose and delivery hose can be of variable length and pressure rating to satisfy needs of application.

Supply jars **76a-c** and storage containers **74a-c** can be of variable sizes, or materials,

Handle assembly **12** components could be of any material resistant to the temps and pressures associated with its application.

The lengths of each of the three mentioned standard pipe nipples **39**, **54**, and **71** can be of variable material, length or operating pressures to fit a range of container sizes and applications.

The scope of this invention should be determined by the appended claims and their legal equivalents, and the descriptions provided should not be construed as limiting the scope of the invention.